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Attorneys for Defendant,
SEAGATE TECHNOLOGY LLC

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA, SAN FRANCISCO DIVISION

IN RE SEAGATE TECHNOLOGY LLC LITIGATION CONSOLIDATED ACTION	Case No. 3:16-cv-00523-JCS **DECLARATION OF DONALD ADAMS, PE IN SUPPORT OF SEAGATE'S OPPOSITION TO PLAINTIFFS' MOTION FOR CLASS CERTIFICATION** **Date:** March 30, 2018 **Time:** 9:30 a.m. **Place:** Courtroom G **Judge:** Hon. Joseph C. Spero Second Consolidated Amended Complaint filed: July 11, 2016

REDACTED VERSION OF DOCUMENT SOUGHT TO BE SEALED

Table of Contents

DECLARATION OF DONALD ADAMS, PE

1. I have been retained as an expert by Defendant Seagate Technology, LLC ("Seagate") to provide an analysis and rebuttal of the Declaration of Andrew Hospodor ("Hodpodor") that Plaintiffs submitted in support of their Motion for Class Certification.

2. Specifically, I was asked to evaluate:

(a) whether the evidence Hospodor cites support his opinions in his Declaration;

(b) whether Hospodor presented evidence that Seagate's internal, desktop ST3000DM001 products had an AFR above 1% across the class period (2011-2016) and across the different versions of the ST3000DM001 (Grenada Classic, Grenada BP and Grenada BP2);

(c) whether Hospodor's opinions are based on sufficient data and are the product of accepted principles of reliability analysis correctly applied to the information and data he cites.

I. Summary of Relevant Experience

3. My experience is primarily in the design and development of HDDs since the early 1980's. I started as an electrical engineer designing magnetic recording data channels while completing my studies in communications systems at Santa Clara University. A significant part of my formal training was in Probability Theory. By the 1990's I was increasingly responsible for the complete design of HDD products at Maxtor, SyQuest, Quantum and then Maxtor again as a Project Engineer/Manager and Engineering Director. By the early 2000's I had been the responsible engineer for more than five HDD products from early design, to development and qualification, through transfer to high volume manufacturing. I have contributed to the design of more than ten HDD and related products that have gone into high volume production. At various times throughout my career I have conducted or supervised reliability testing and analysis on hard drives.

4. During this time I also worked on product/technology development and planning. This work led to integration of important technologies to advance areal density, reduce operational costs, and/or develop new applications for HDDs. Of note is the joint development of the Digital Video Recorder with TiVo and other related consumer media products at Quantum. I also led numerous special task forces to resolve critical factory and customer problems for yield and/or reliability which resulted in new design and development processes.

5. Both Dr. Hospodor and I worked at Quantum in the late 1990s and early 2000s where I was responsible for several HDD products through product qualifications and transfer to manufacturing. This included reliability testing and analysis. To my knowledge, Dr. Hospodor was only peripherally involved in this type of work at Quantum.

6. More recently I have continued to work or consult as a senior engineering manager and electrical engineer. After leaving Maxtor I led the engineering team at Nanochip in a joint technology development with Intel for probe storage based on MEMS technology and Atomic Force Microscopy. Since 2009 I have focused mainly on my consulting practice with a four year stint at Western Digital from 2011 through 2015. During this time, I was involved in defining the architecture and design of hybrid HDD electronics. This included qualification testing (reliability testing and analysis) of the first products. I also worked on special problems in signal/power integrity and Electromagnetic Compatibility.

7. I hold a Master of Science degree in Electrical Engineering (MSEE) from Santa Clara University and a Bachelor of Science degree in Electrical Engineering (BSEE) from San Jose State University. I am also a registered Professional Electrical Engineer in California, # E-19198, and continue to practice in the field.

8. My curriculum vitae is attached as Appendix 1 hereto. The materials I reviewed in preparing this declaration are listed in Appendix 2.

9. I am presently being compensated for my work in this matter at my current billing rate of $350 per hour. My compensation is not dependent on the opinions that I provide or the outcome of this litigation.

II. Hard Drives and Products at Issue

10. In 2011, Seagate began manufacturing a computer hard disk drive ("HDD") bearing model number ST3000DM001. HDD technology was first developed by IBM in the 1950s to provide high performance mass data storage for computer systems of that era. It is based on magnetic recording of bits of data in a layer of material on rotating disks (or "platters") by means of a read-write head that flies over the surface of the disks to access the data. Both the size and capacity of HDDs have evolved since then to provide tremendous capability that enabled

widespread personal computing and big-data applications today.

[redacted]

[redacted]

1 [redacted]

2 [redacted]

13. It is my understanding that Plaintiffs define the relevant period (the "class period") as from the earliest release of the ST3000DM001 drives to February 1, 2016. (Hospodor Decl., footnote 1.) Since the first version of the ST3000DM001 drives was first approved for release as an external, USB product in April, 2011 (Ex. 1 [FED_SEAG0026697]), I assume the proposed class period to be April, 2011 – February, 2016.

14. Unless otherwise noted, Exhibits referred to in this declaration are Exhibits to the Declaration of Liên Payne filed concurrently herewith.

III. Summary of Opinions

[redacted]

[redacted]

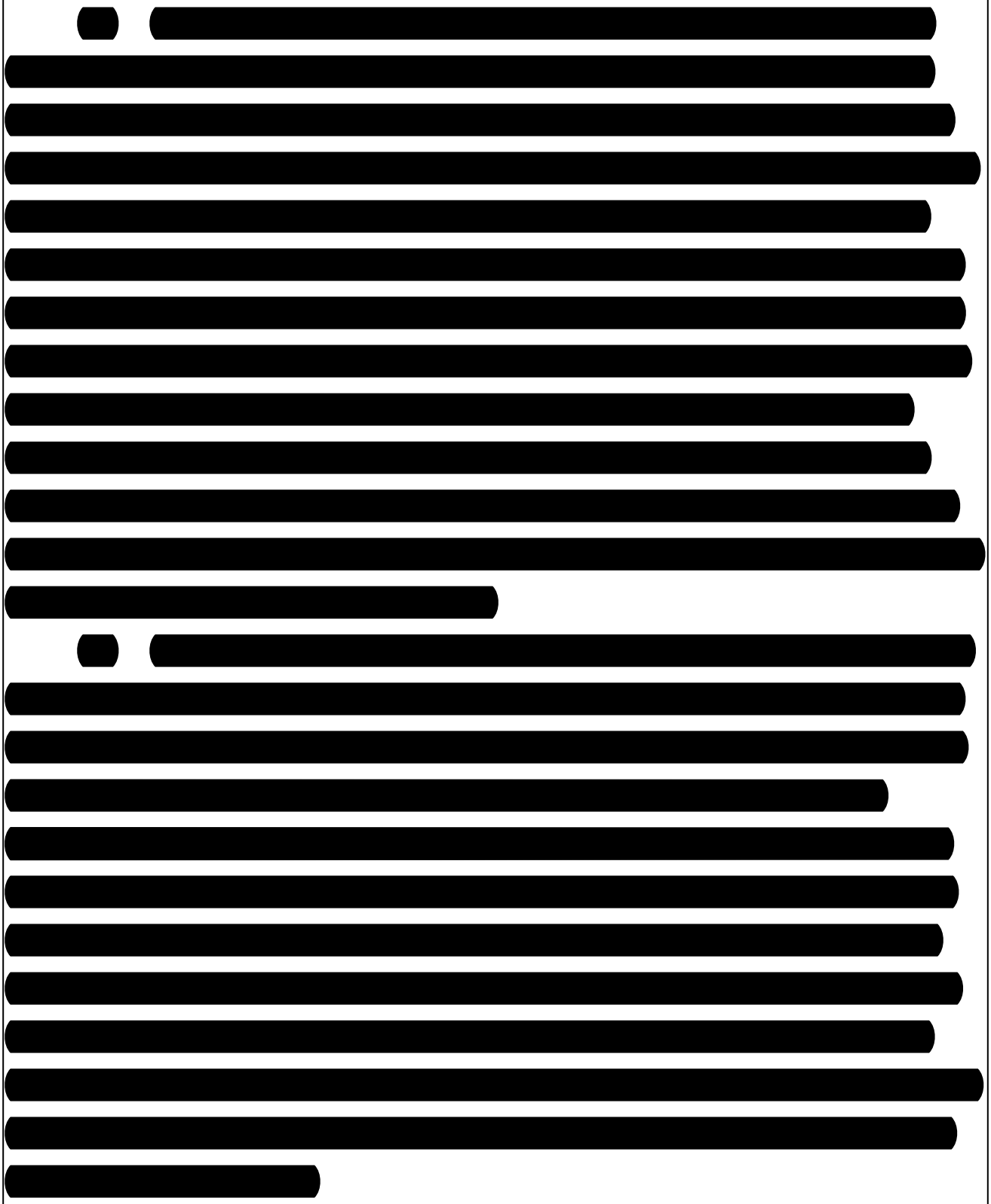
[3] [redacted]

[4] As noted, exhibits referred to in this declaration are Exhibits to the Declaration of Liên Payne, filed herewith.

[redacted]

[5] [redacted]

[6] [redacted]



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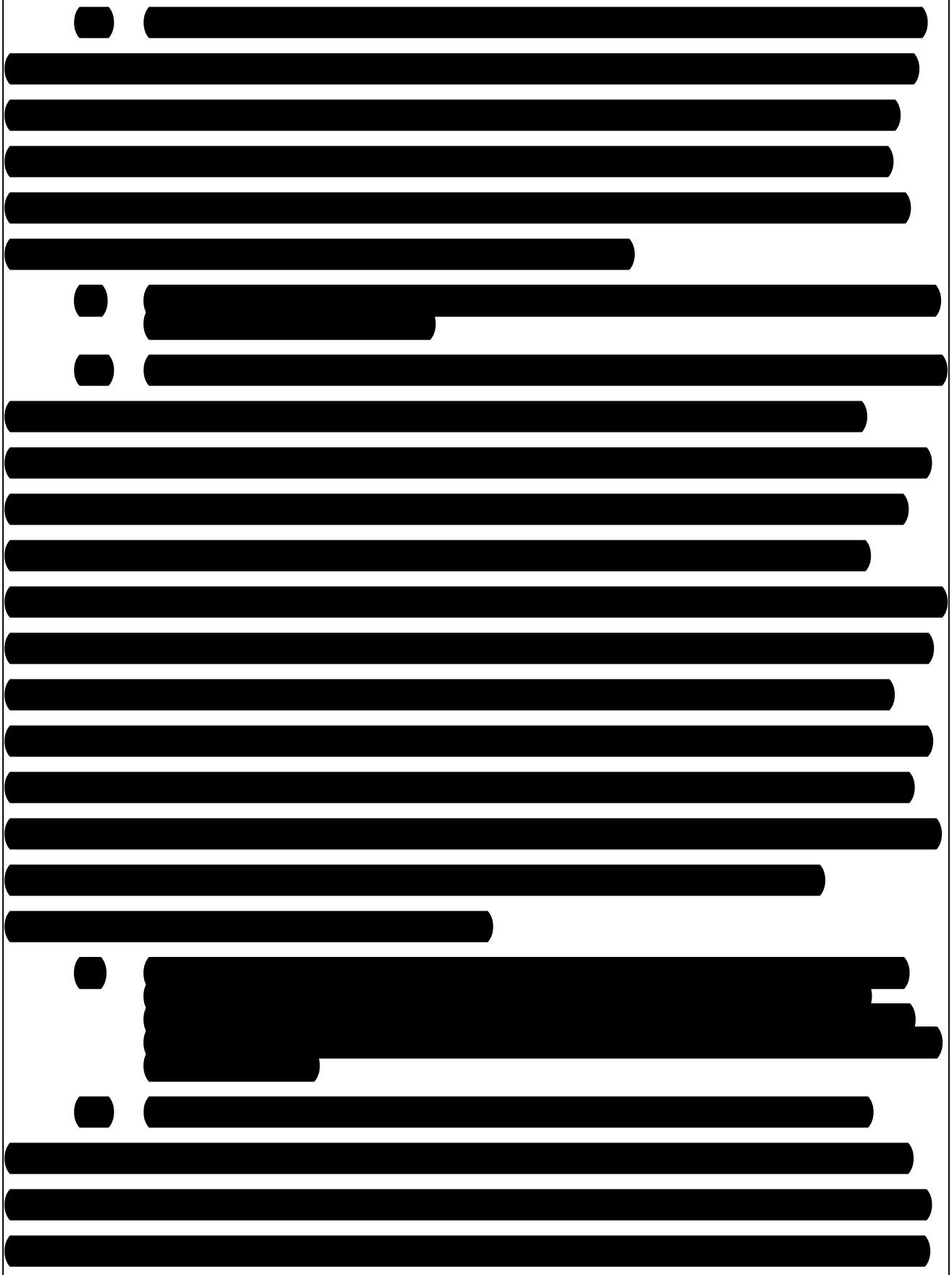

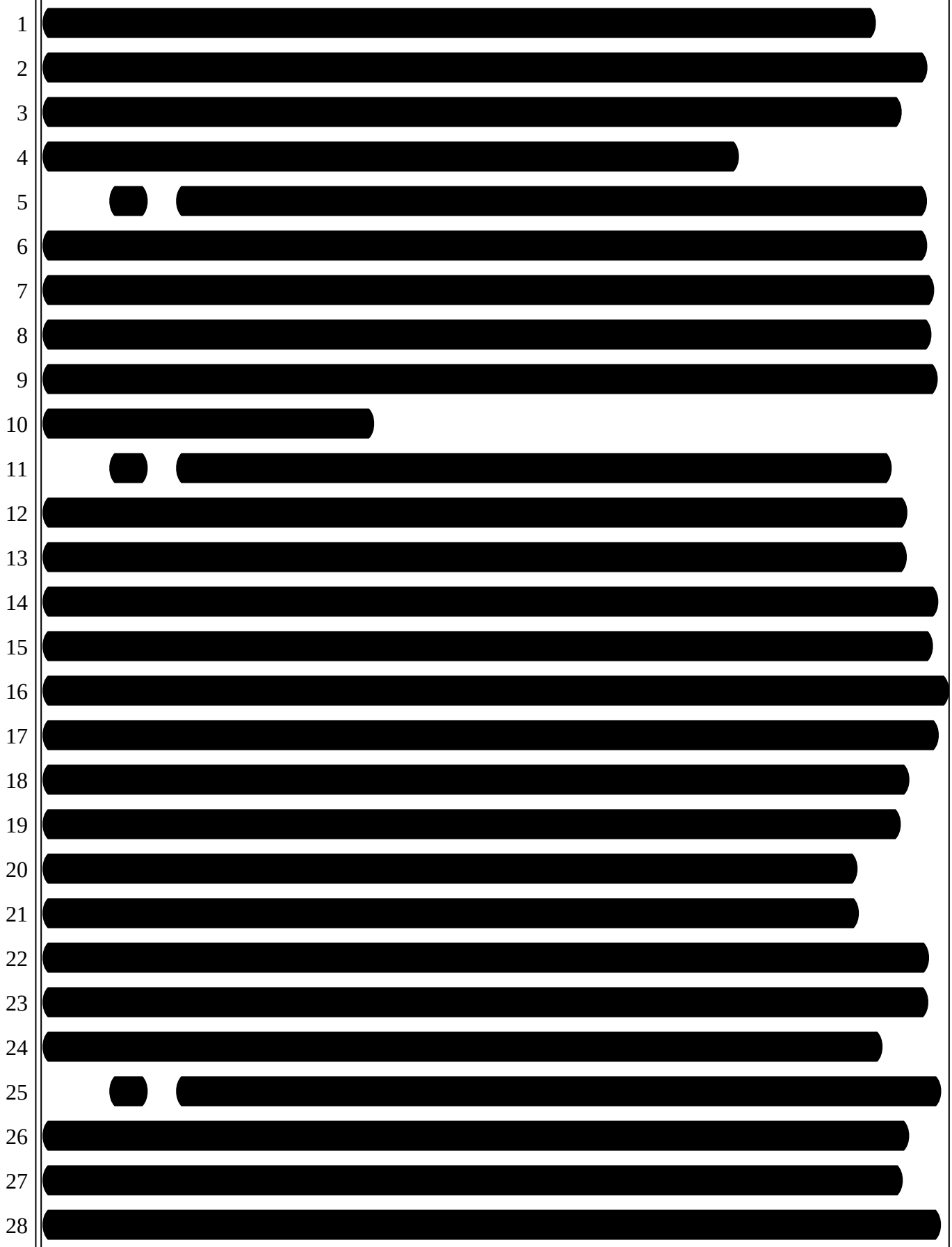

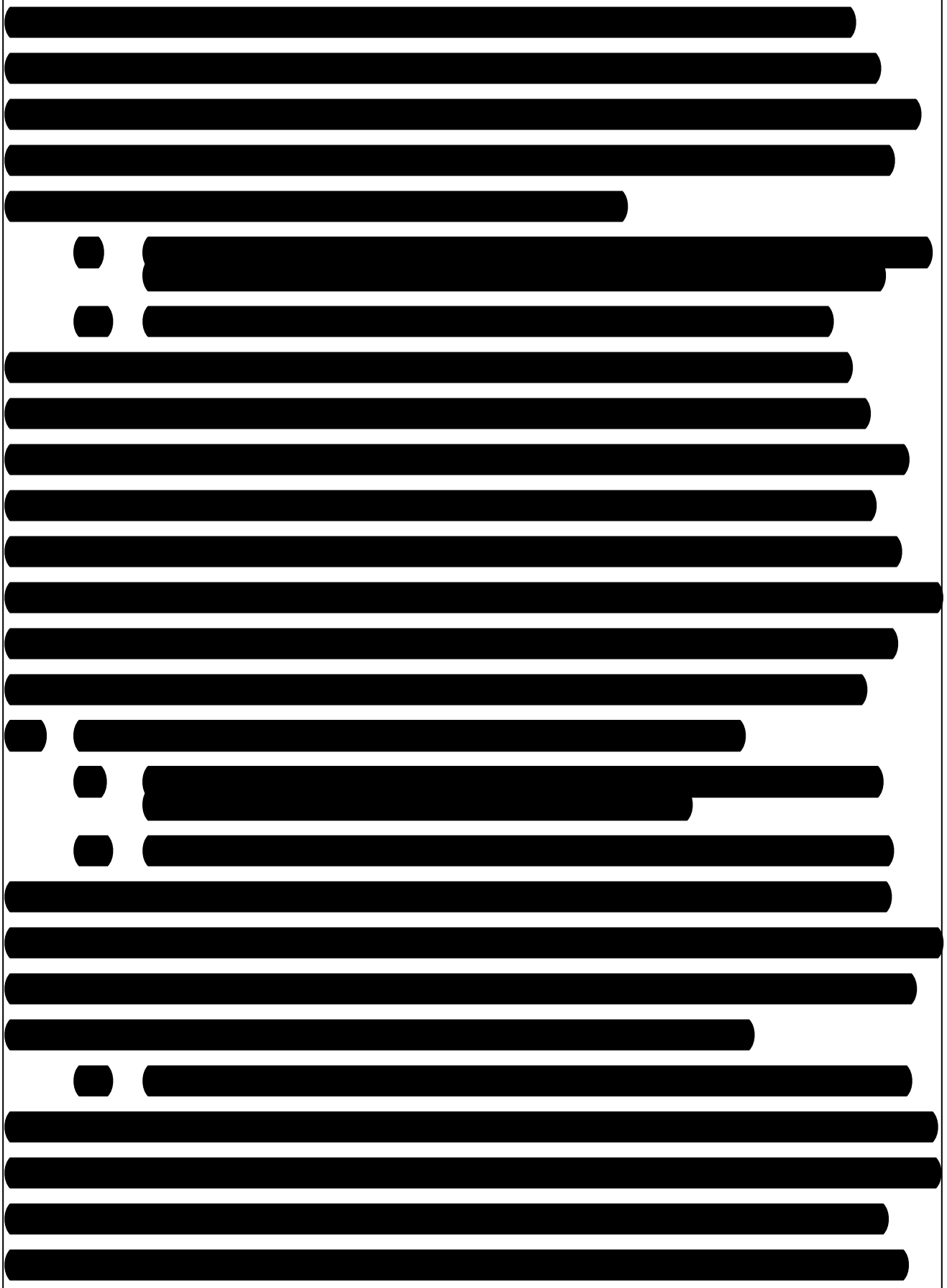

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[8] [redacted]

[9] [redacted]

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[10] [redacted]

[11] [redacted]

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[12] [redacted]

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Figure 2 [redacted]

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[13] [redacted]

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[14] [redacted]

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Figure 3. [redacted]

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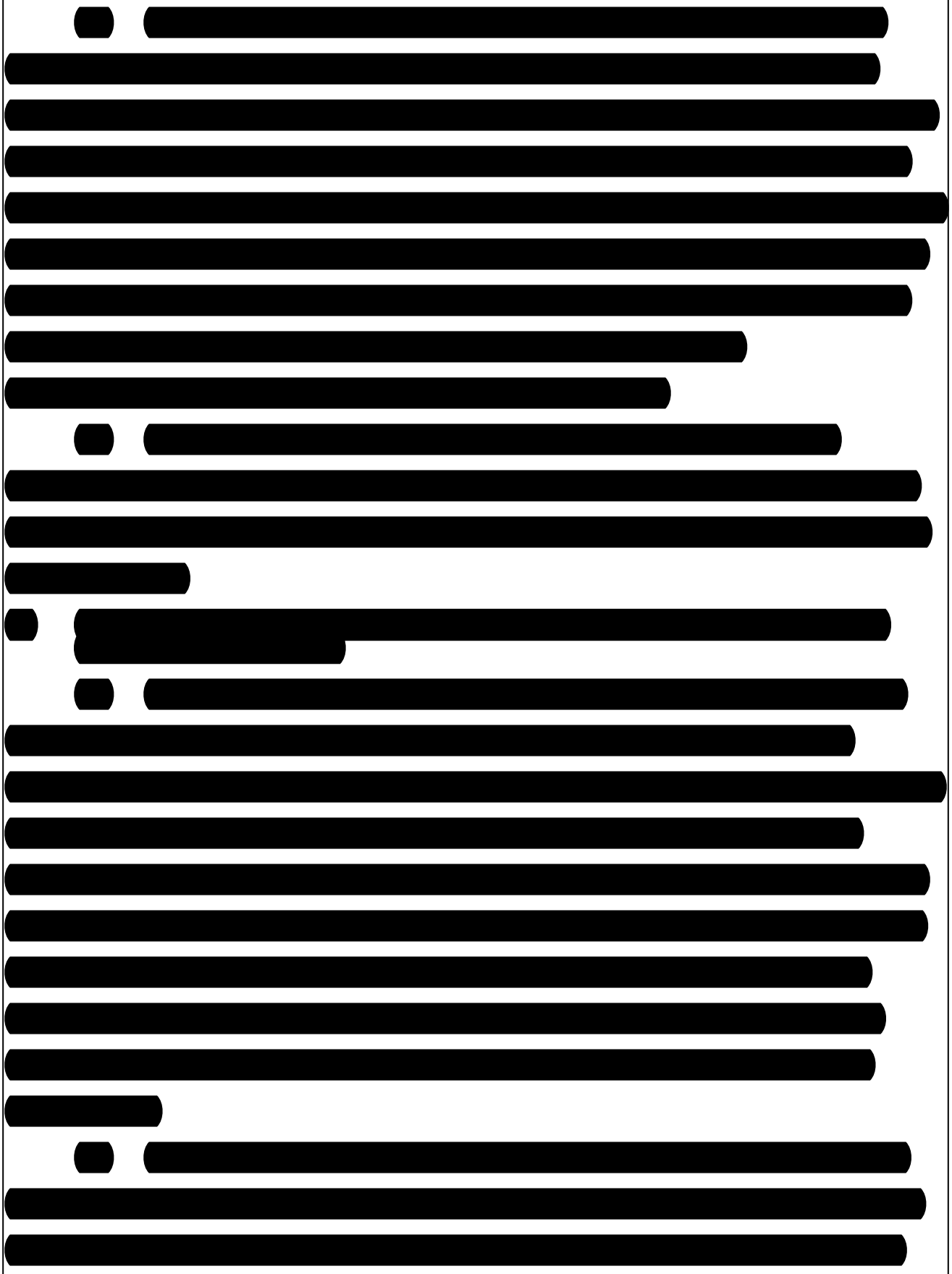
[15] [redacted]

[16] Copies of ISO certificates indicating certification since 1996 (for its Longmont, CO facility) and 1999 (for other sites) to present are available on Seagate's website at https://www.seagate.com/global-citizenship/iso-9001-certification/. (Paneno Decl., ¶ 4.)



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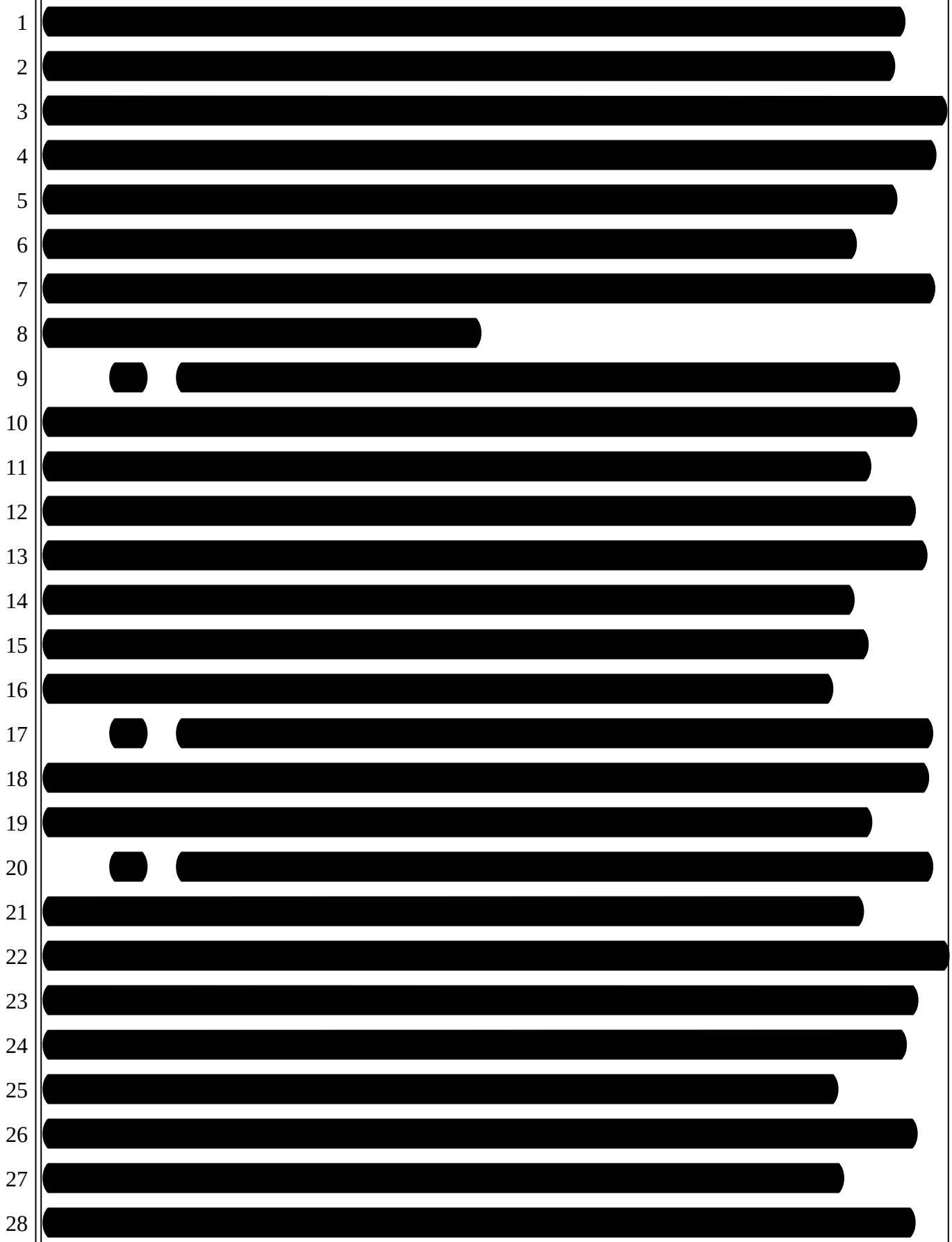

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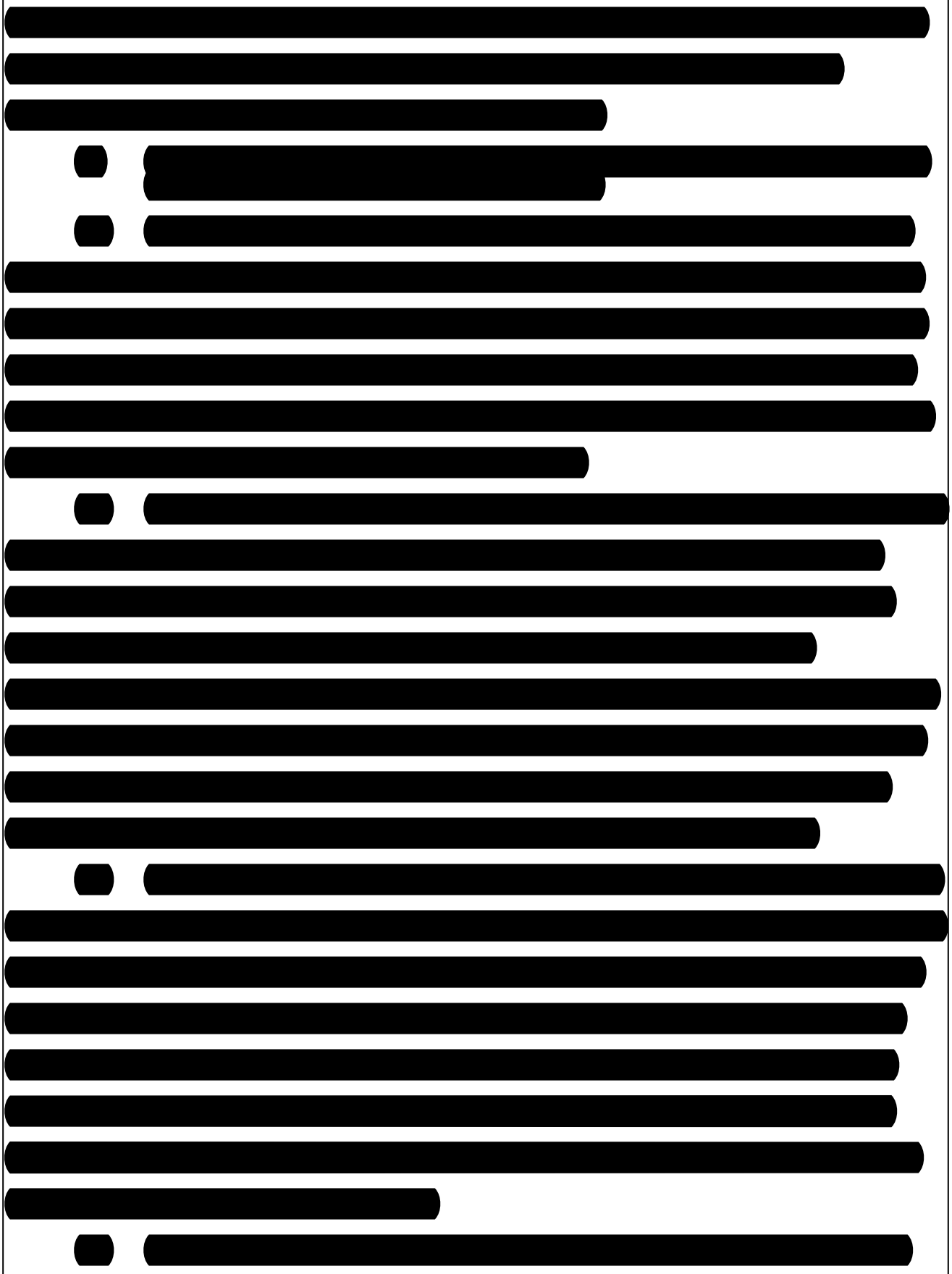

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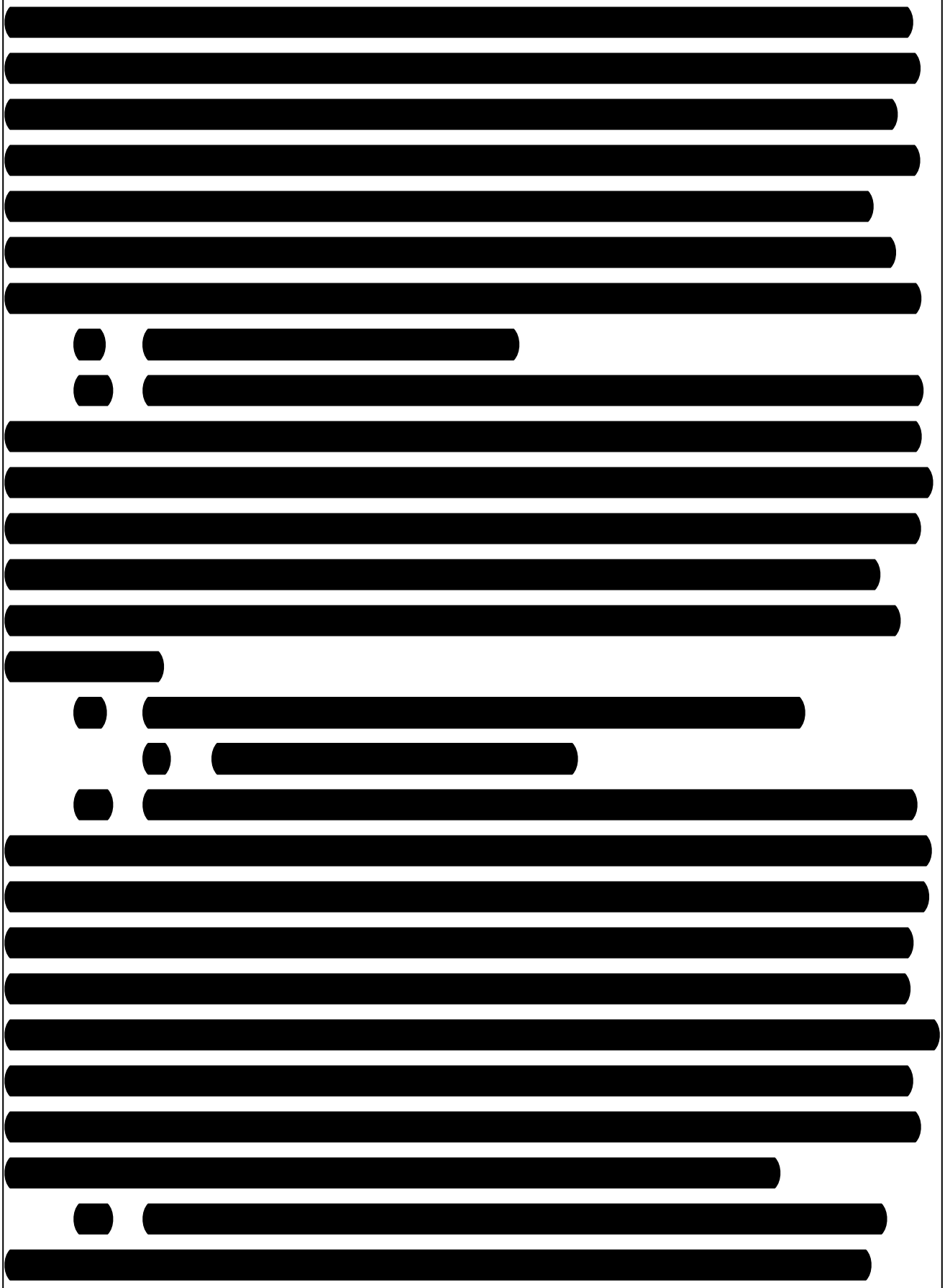

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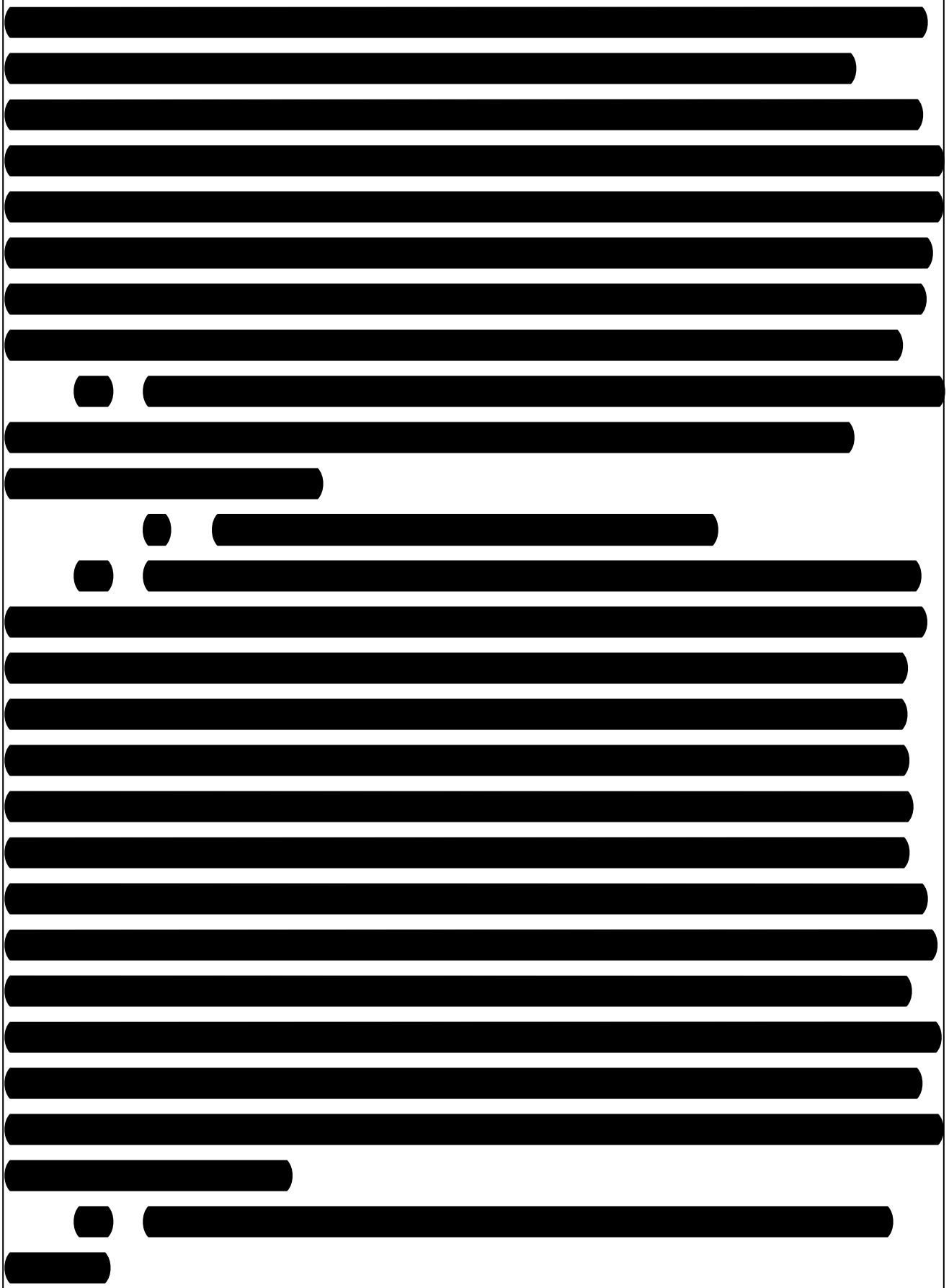

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Figure 4.

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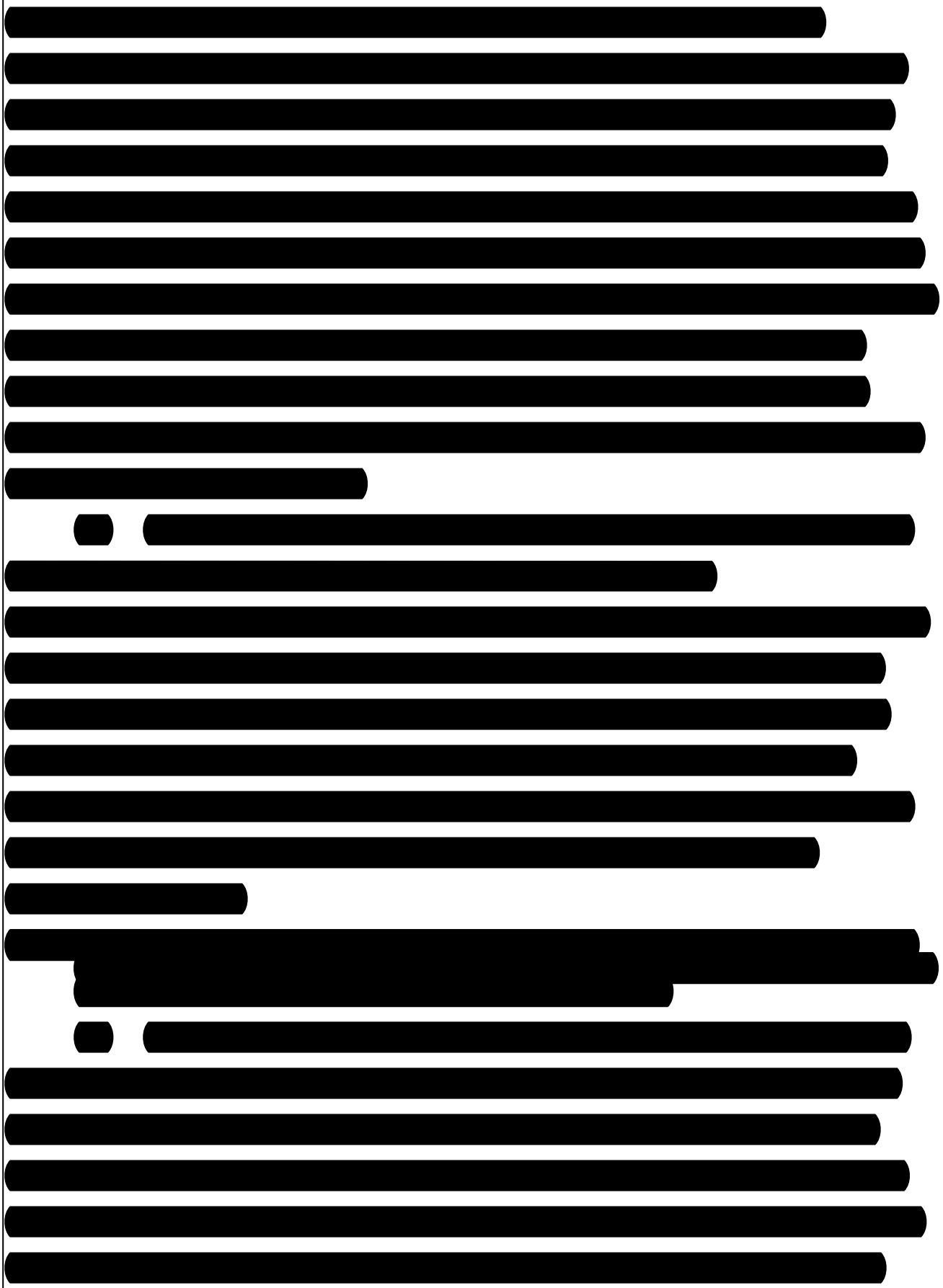

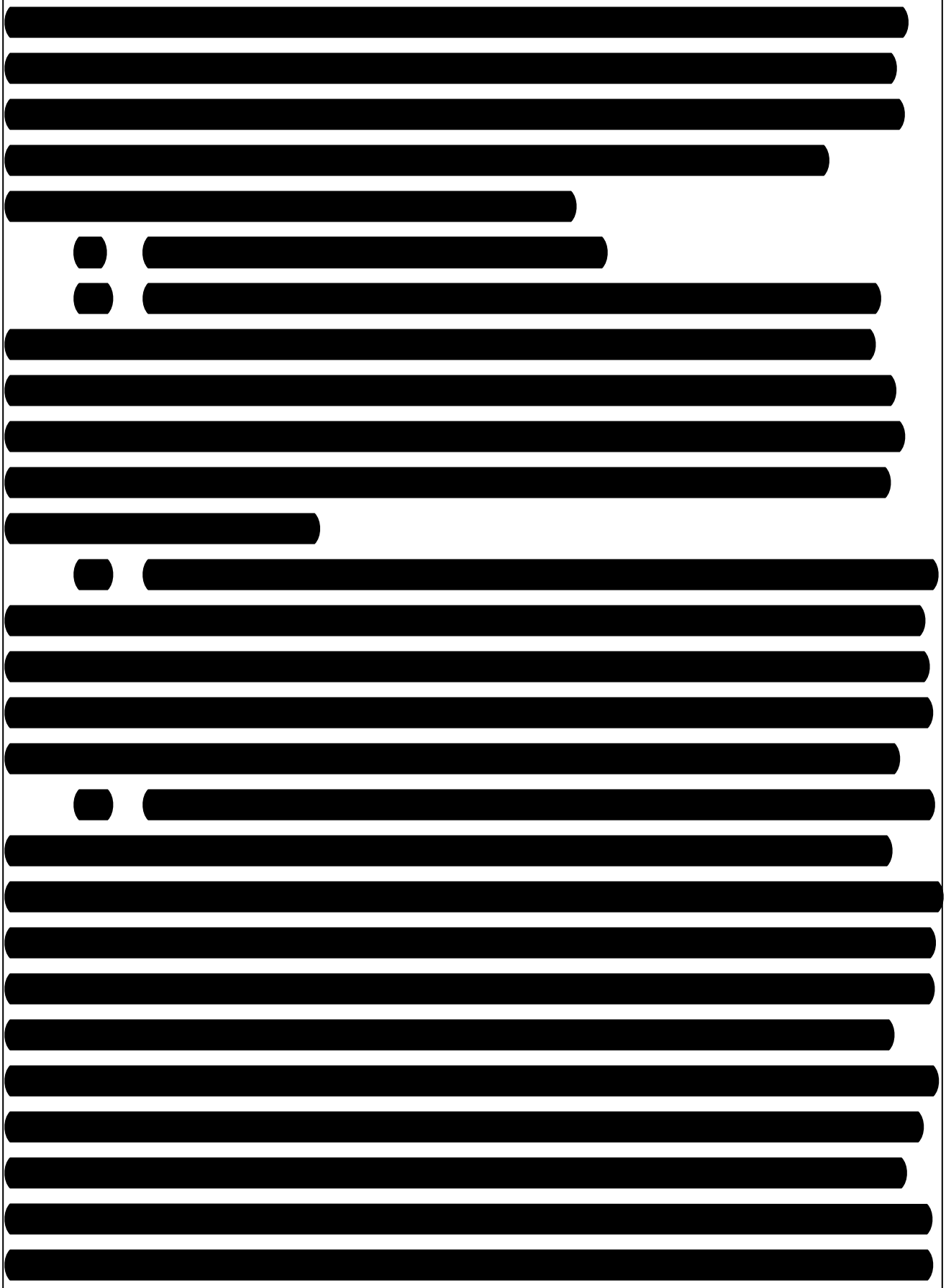

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26 [redacted]

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Figure 5. [redacted]

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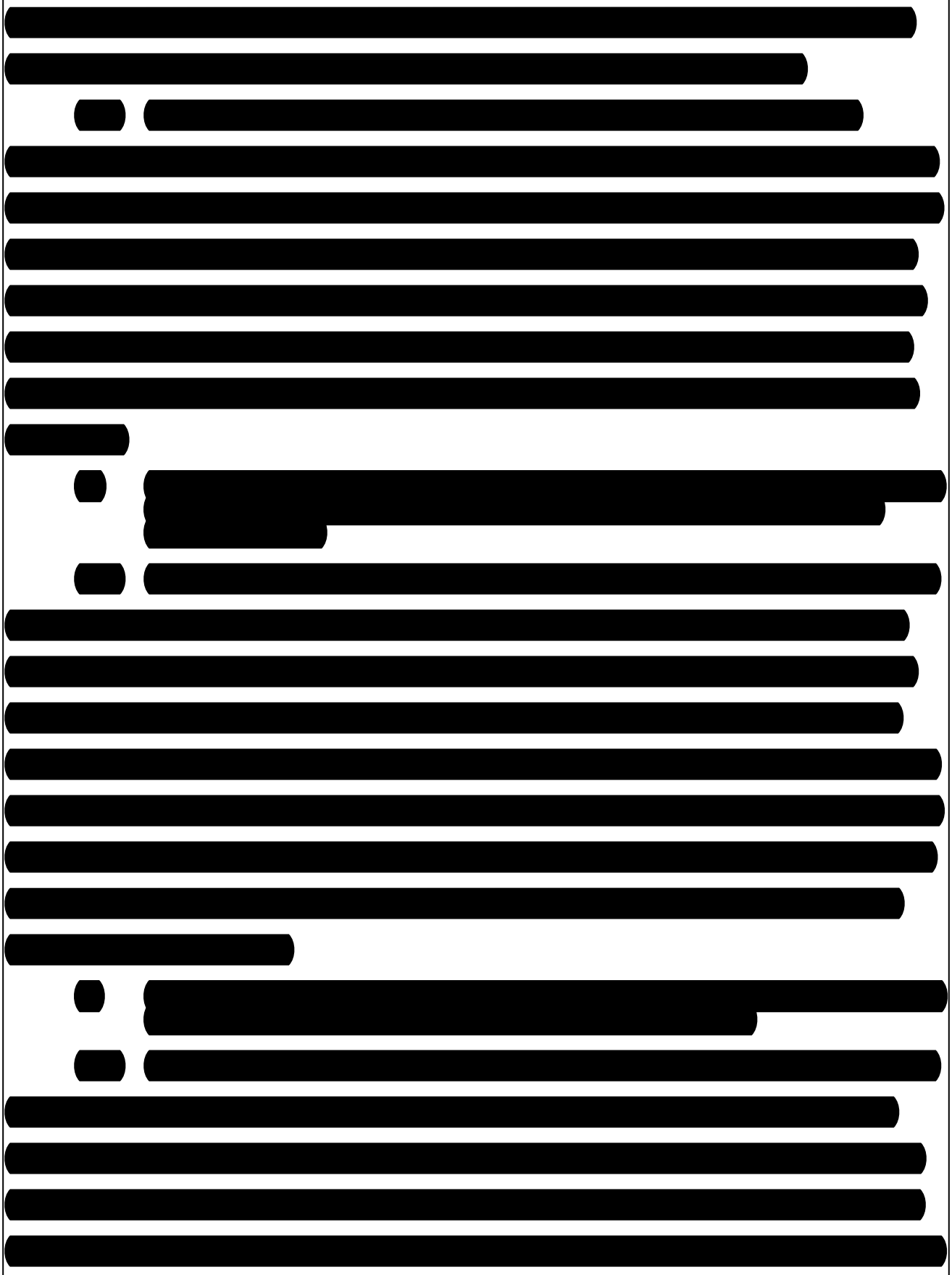
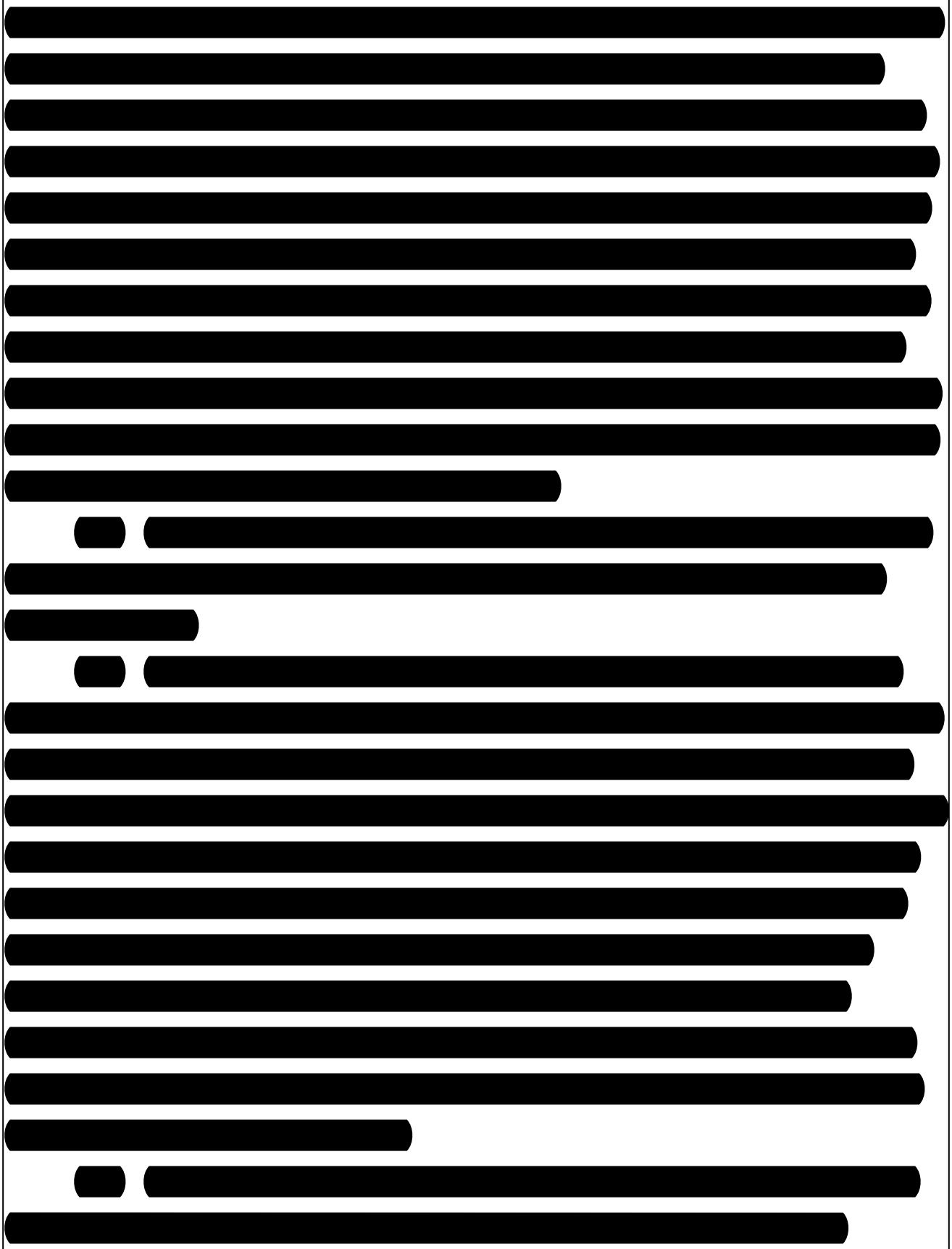




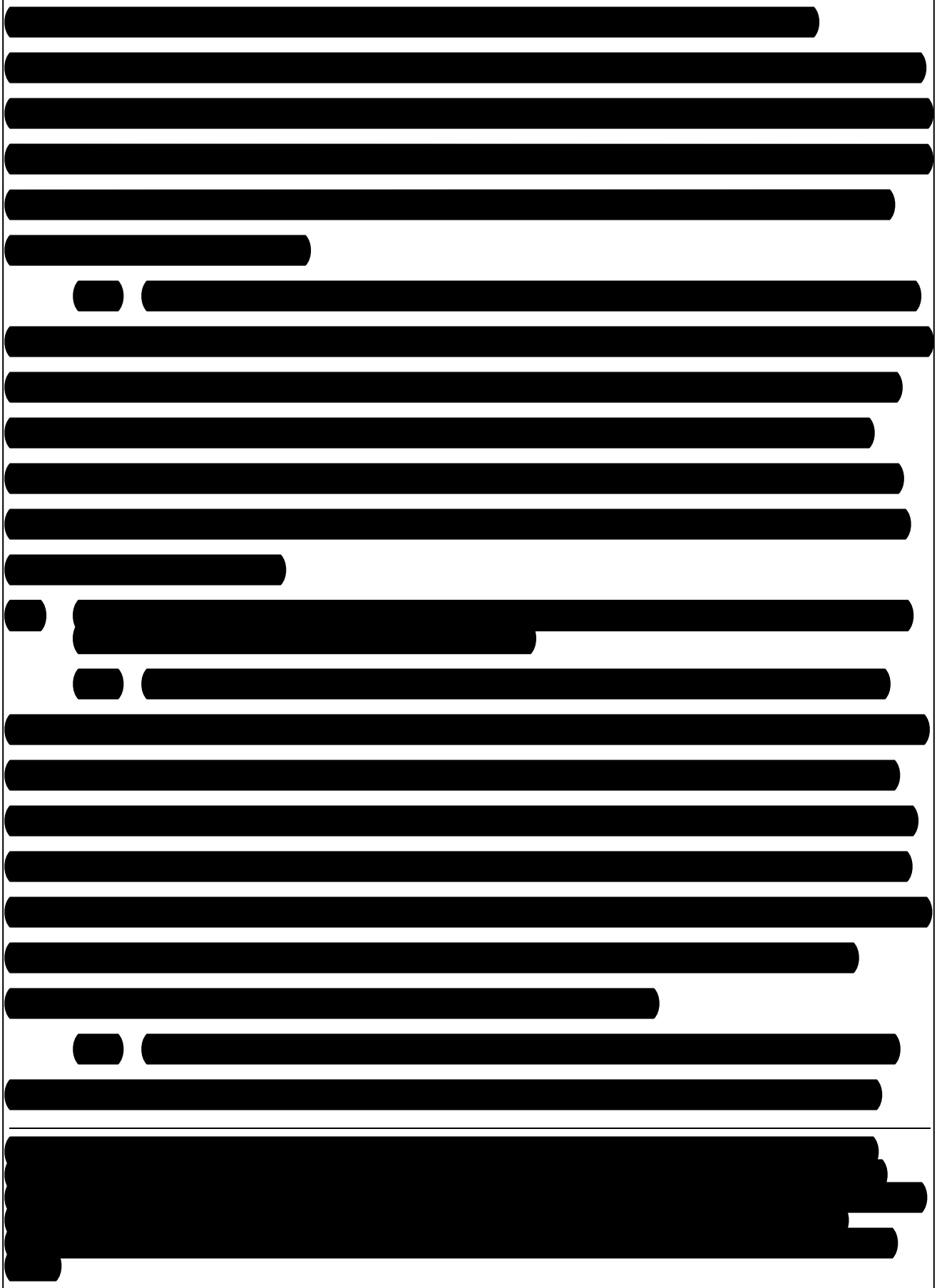
[redacted]

[33] See http://advances.sciencemag.org/content/3/8/e1603322.full (wet bulb temperature "of around 35°C for even a few hours will result in death even for the fittest of humans under shaded, well-ventilated conditions").

[34] [redacted]

[35] Houston, Texas is one of the hottest and most humid metropolitan locations in the world. Singapore is the worst. Houston, Texas is hardly representative of conditions elsewhere in the US. See also https://www.nytimes.com/2015/06/07/opinion/sunday/the-deadly-combination-of-heat-and-humidity.html ("we found that over the period from 1981 to 2010, the average American experienced about ***four*** dangerously humid days, with wet-bulb temperatures exceeding ***80 degrees***.")

[36] [redacted]



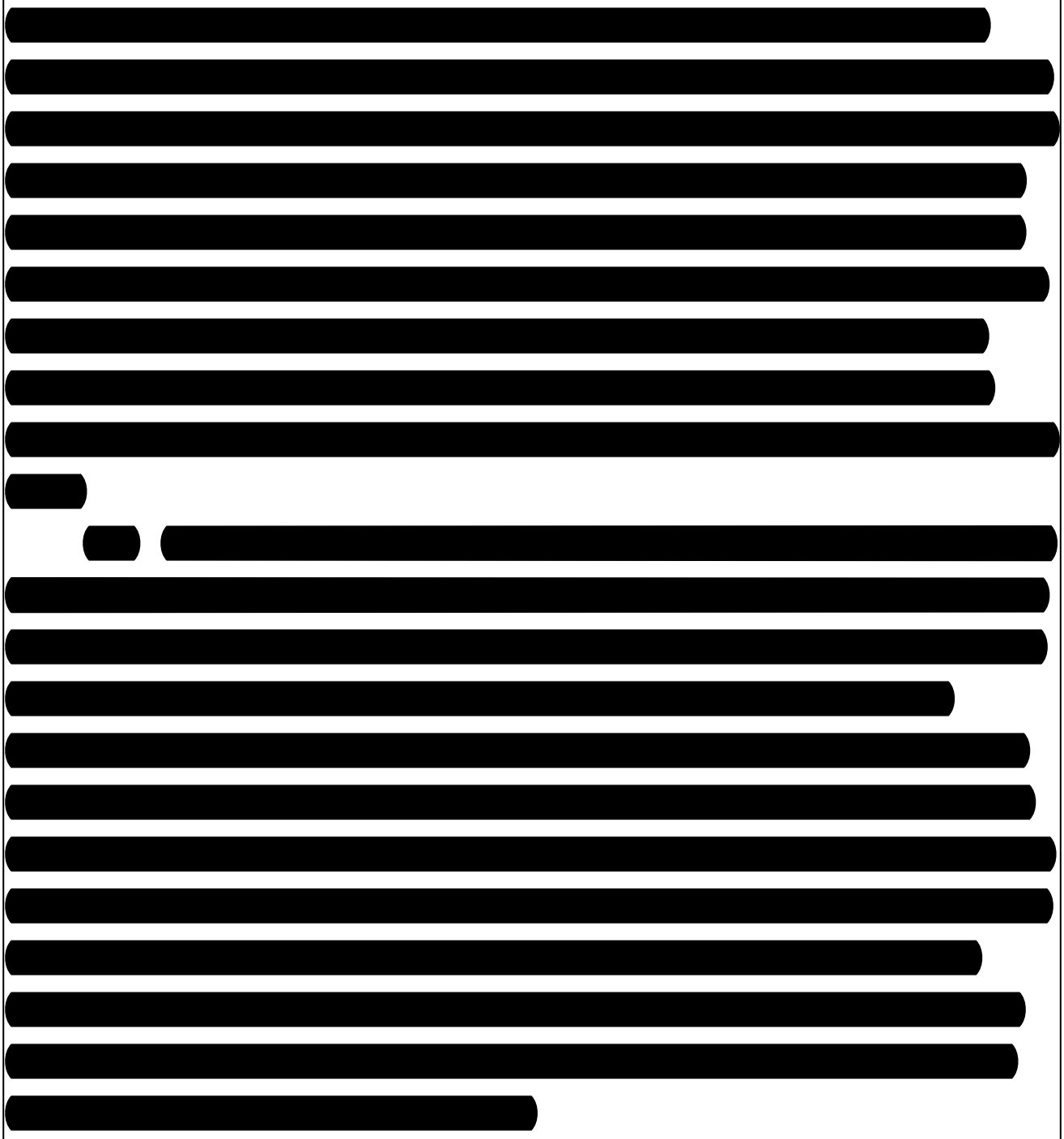


Figure 6 (Ex. 1 [FED_SEAG0026697] at p. 26704.)

[redacted]

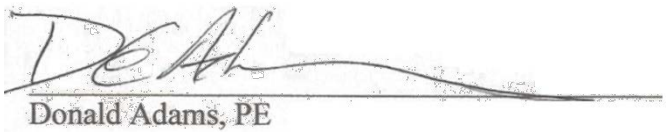
X. Supplementation of Opinions

120. The opinions expressed herein are my own, based on my current understanding of the facts and circumstances surrounding this matter and my review of the information listed in Appendix 2. I understand that discovery is continuing and I reserve the right to supplement this

declaration or revise my opinions in light of additional information or documents that may be brought to my attention. I will consider any criticisms of my opinions or bases for my opinions brought to my attention or offered by experts retained by Plaintiffs, which may cause me to revise or supplement my opinions.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on this 5th day of January, 2018, at Pleasanton, California.



Donald Adams, PE

APPENDIX 1

Consultant Curriculum Vitae

Donald E. Adams, PE

Expertise

- Embedded Systems Design and Development
- Hard Disk Drives
- Data Storage Systems
- Analog, RF and Digital Circuit Design/Analysis
- E&M Fields and EMC problems
- Probability, Statistical Analysis and DOE
- Data Communication Systems
- Magnetic Recording Systems
- Control Systems and Motor Controls
- Project Management
- Phase Locked loops & Delay Locked Loops
- ADC/DAC and Digital/Firmware Controls
- Power Converters, Controls and management
- Modem Sensors and MEMS Sensors
- AC/DC Magnetic Motors and Electrostatic MEMS Motors
- Analog and Digital Video
- Programming: Python, C, Basic, Assembly, Fortran, Matlab, SPICE, Excel

Professional Summary

Employment History

From:	2009	**Adams & Associates Consulting**
To:	Present	Pleasanton, CA
	Position:	*Independent Consulting Engineer*
		Technical and business development services specializing in electronic systems for data storage, MEMS, consumer products and electric power/energy. Subject matter expert and witness for patents and cases involving electrical/electronic engineering.

From:	2011	**Western Digital**
To:	2015	Irvine, CA
	Position:	*Sr. Principal Engineer*
		Electronic architectures and system requirements specifications for power management in HDD and Flash storage systems. Advanced electronic system architecture development. SI, PI and EMC consulting. Special projects management. New graduate engineer training and mentoring.

Consultant Curriculum Vitae

From: 2004 **NanoChip**
To: 2009 Fremont, CA
Position: *Vice President Engineering*
Managed all engineering work and a Joint Development Program with Intel.

- Completed research and built an engineering team for the development of a probe storage memory device.
    - The technology is based on atomic force probes with ferroelectric media built with MEMS structures and processes in a system similar to a disk drive or HDD.
- This team made several significant technology and architectural breakthroughs which resulted in more than 75 patent applications.
- Technical feasibility was demonstrated by early 2008 and the team was moving into full product development when funding ran out at the end of 2008.

From: 2001 **Maxtor Corporation**
To: 2004 Milpitas, CA
Position: *Senior Engineering Director & Principal Engineer*
Managed technology transfers and pre-development projects in the Advanced Technology Group.

- Finished Printed-Media-Self-Servo-Write transfer work started at Quantum after the merger with Maxtor. A derivative was implemented for all Maxtor product lines.
- Led the pre-development team for a 2.5 inch mobile computing HDD platform.
    - As an outgrowth of the mobile computing work I became the power management leader for all new products.

From: 1996 **Quantum Corporation**
To: 2001 Milpitas, CA
Position: *1999-2001: Senior Engineering Director*
Co-founded the Consumer Electronics Business Unit as Chief Engineer. The group was chartered to find new non-PC applications and business opportunities.

- Led investments and co-development with TIVO, Replay, Panasonic and other brand name consumer electronics companies that created Personal Video Recorders and Digital Audio Jukeboxes.
    - Investments returned more than $30M in the first 18 months.
- Developed core technology capabilities for digital video and audio data stream management. 1394AV technology and products were also developed and demonstrated.

Consultant Curriculum Vitae

- Ten patent applications came out of the group and several have been issued. Most of the technology has since been incorporated in all HDD product lines. (Silent seeks, embedded file systems, capacity and content security)

- Moved to the Advanced Technology Labs to lead the integration of Printed-Media-Self-Servo-Write technology, a critical new manufacturing technology, into multiple products across the entire business.
  - This technology reduced the incremental capital needed to produce HDDs by more than $50M per year.

1996-1999: Engineering Director
Director for two development teams comprising more than 100 engineers and extended teams from manufacturing, process engineering, test engineering, materials, and marketing. Worked directly with MKE, Quantum's manufacturing partner in Japan. Annual budget >$16M.

- Delivered four high volume 5.25" HDD products. Production yields were over 90%. Volume was ~1 Mu/quarter for each and generated over 15% gross margins.
- Concurrently advised two additional cross functional teams that developed two more high volume 3.5" HDD products.
- Served as HDD architect in the product and technology planning process for 1 year.
- Initiated and led several technical task teams that tackled critical multi-functional problems for the business division. (FIT, SMART, Sing-no-spin, Adapt' RO-Correction)

From: 1993 **SyQuest Technology**
To: 1996 Fremont, CA
Position: *Engineering Vice President*

From: 1990 **Iota Memories**
To: 1993 Santa Clara, CA
Position: *Vice President Engineering & Co-Founder*
Private start-up developing data storage products acquired by SyQuest.

From: 1986 **Maxtor**
To: 1990 San Jose, CA
Position: *Program Manager & Read-Write Engineer*

From: 1983 **Tulin**
To: 1986 San Jose, CA
Position: *Engineering Director & Read-Write Engineer*

Consultant Curriculum Vitae

From:	1981	**Ampex**
To:	1983	Redwood City, CA
	Position:	*Senior Staff Engineer, Read-Write*

From:	1978	**Memorex**
To:	1981	Santa Clara, CA
	Position:	*Senior Electronic Engineer, Read-Write Channels*

From:	1973	**Amdahl**
To:	1978	Sunnyvale, CA
	Position:	*Test Equipment Development Manager, Senior Test & Associate Engineer*

Consulting History

From:	10/17	**Sentient Energy**
To:	present	Burlingame, CA
	Duties:	Review of IEEE 495 testing for Fault Circuit Indicator product.

From:	3/12	**Intel**
To:	9/12	Santa Clara, CA
	Duties:	System architecture development and design reviews.

From:	4/10	**Samsung, SISA**
To:	9/11	San Jose, CA
	Duties:	Advisory engineer for HDD technology and magnetic recording. Signal integrity evaluation of high speed DDR2 buss and recommendations to improve products and the development process.

From:	3/11	**Superstar Productions**
To:	6/12	Miramar, FL
	Duties:	Hardware and firmware development using IRdA and a 16 bit microcontroller for a consumer electronics product.

From:	2/11	**Test Equipment Plus**
To:	12/11	La Center, WA
	Duties:	Development of MEMS based thermocouple RF and Microwave power sensor.

From:	3/10	**Voxis for Topcon**
To:	12/10	Richmond and Livermore, CA
	Duties:	Developed prototype hardware and MatLab routines for a new machine vision feature to be used on Total Stations/Scanner tools for civil engineers and surveyors. Prototype was successfully demonstrated and field tested.

Consultant Curriculum Vitae

From: Summer 09 **Private Investor**

Duties: Evaluation and development of a prototype tracking solar thermal electric power converter based on a concept using the Seebeck effect.

Patents

Patent Number	Issue Date	Title
9,422,668	9/13/2016	Adaptive Power Management Control with Performance Feedback
9,280,200	3/8/2016	Automatic Peak Current Throttle of Tiered Storage Elements
8,264,941	9/11/12	Arrangement and Method to Perform Scanning Readout of Ferroelectric Bit Charges
7,796,493	9/14/10	Cantilever on Cantilever (MEMS) Structure
7,738,350	6/15/10	Probe Storage with Doped Diamond-like Carbon Medium and Current Limiter
7,310,196	12/18/07	Parking a Transducer Responsive to a Park Signal
7,280,301	10/9/07	Temperature Estimator for Electronic Device
7,196,862	3/27/07	Coherent Phase Data Segment Layout in Data Storage Device
6,487,646	11/26/02	Apparatus and Method Capable of Restricting Access to Data Storage Device
6,195,732	2/27/01	Storage Device Capacity Management

Education

Year	College/University	Degree
1983	Santa Clara University, Santa Clara, CA	MS, Electrical Engineering
1976	San Jose State University, San Jose, CA	BS, Electrical Engineering (with Distinction)

Publications

1. B. Kim, D. Adams, Q. Tran, Q. Ma, V. Rao, "Scanning probe charge reading of ferroelectric domains," Appl. Phys. Lett., v. 94(6), 063105, 2009.
2. B. Kim, D. Adams, G. Tchelepi, Q. Tran, Q. Ma and V. Rao, "Scanning Probe Charge Reading of Ferroelectric Polarization with Nanoscale Resolution," 2009 NSTI Nanotechnology Conference and Expo, May 3-7, Houston, TX, (2009)
3. D. Adams, N. Belov, T-K. Chou, J. Heck, B. Kim, G. Knight, Q. Ma, V. Rao, G. Tchelepi, "Nanochip: A MEMS-based Ultra-High Data Density Memory Device," 2009 NSTI Nanotechnology Conference and Expo, May 3-7, Houston, TX, (2009).
4. N. Belov et al., "Thin-layer Au-Sn solder bonding process for wafer-level packaging, electrical interconnections and MEMS applications," Int. Interconnect Technology Conf., Sapporo, June 2009.

Consultant Curriculum Vitae

5. S. Severi et al., "CMOS compatible poly-SiGe cantilevers with read/write system for probe storage device," Transducers 2009, Denver, June 2009.
6. N. Belov, D. Adams, D. Ascanio, T-K. Chou, J. Heck, B. Kim, G. Knight, Q. Ma, V. Rao, J.-S. Park, R. Stark, G. Tchelepi "Nanochip: A MEMS-based Ultra-High Data Density Memory Device," Advanced Technology Workshop "Advanced Materials and Technologies for Micro/Nano Devices, Sensors and Actuators, St.-Petersburg, June 2009.
7. D. Adams, N. Belov, T-K. Chou, J. Heck, B. Kim, G. Knight, Q. Ma, V. Rao, G. Tchelepi, "Nanochip: A MEMS-based Ultra-High Data Density Memory Device" – *future publication in "Sensors and Transducers."*

Professional Associations and Achievements

- Member, IEEE
- Eta Kappa Nu, Electrical Engineering Honors
- Registered Professional Engineer in Calif. # E19198

Adams & Associates
Pleasanton, CA
925-960-3295
donaldadams@sbcglobal.net

APPENDIX 2

Documents Considered

Pleadings and Deposition Transcripts

July 26, 2017 30(b)(6) Deposition of Glen Almgren.
September 7, 2017 Personal and 30(b)(6) Deposition of Patrick Dewey.
September 8, 2017 Deposition of Andrei Khurshudov.
December 15, 2017 Deposition of Andrew Hospodor
June 30, 2017 Declaration of Alan Ng (Case No. CGC-15-547787)
June 30, 2017 Declaration of Dave Rollings (Case No. CGC-15-547787)
January 5, 2018 Declaration of Mary Paneno (Case No. 3:16-cv-00523-JCS)
January 5, 2018 Declaration of Patrick Dewey (Case No. 3:16-cv-00523-JCS)
January 5, 2018 Declaration of Glen Almgren (Case No. 3:16-cv-00523-JCS)
January 5, 2018 Declaration of Harrie Netel (Case No. 3:16-cv-00523-JCS)
January 5, 2018 Declaration of Lien Payne (Case No. 3:16-cv-00523-JCS), and exhibits thereto
January 5, 2018 Declaration of Jeff Fochtman (Case No. 3:16-cv-00523-JCS), and exhibits thereto
January 5, 2018 Declaration of Karl Schweiss (Case No. 3:16-cv-00523-JCS), and exhibits thereto

Books and Websites

An Introduction to Applied Probability, Ian F. Blake, 1979
National Institute of Standards and Technology ("NIST")/SEMATECH e-Handbook of Statistical Methods, http://www.itl.nist.gov/div898/handbook see also http://www.itl.nist.gov/div898/handbook/apr/apr.htm
"Life Data Analysis Reference" produced by ReliaSoft Corporation in Tucson, Az., 5/22/2015http://www.ReliaSoft.com
http://www.weibull.com/basics/parameters.htm
https://www.seagate.com/global-citizenship/iso-9001-certification/.
Backblaze, *See What Can 49,056 Hard Drives Tell Us? Hard Drive Reliability Stats for Q3 2015*, (Oct. 14, 2015), https://www.backblaze.com/blog/hard-drive-reliability-q3-2015.
Backblaze, *CSI: Backblaze – Dissecting 3TB Drive Failure* (April 15, 2015), https://www.backblaze.com/blog/3tb-hard-drive-failure.
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